

M. de Filippi has not been more fortunate than his predecessors in his search for the males of the *Eleutheriæ*. M. Krohn still remains the only naturalist who has observed one. The ova are developed rapidly, not, as M. Krohn thinks, between the ectoderm and the endoderm, but in a cavity everywhere bounded by the endoderm. This cavity is at once an ovary and an incubatory pouch, from which the embryos appear to issue only by the laceration of the body and the consequent death of their parent. The sexual organs do not exist throughout the year; from the middle of April (when his observations commenced) to the end of the first half of May the author could not detect a trace of them. From this period all the individuals, without exception, were provided with them. Towards the beginning of June the *Eleutheriæ*, which had previously swarmed in the aquaria, all disappeared. The ova, after undergoing a complete segmentation, become transformed into embryos belonging to the form of the ciliated *Planulæ*.

The author cannot, as MM. Krohn and Gegenbaur have done, find in the division of the arms of the *Eleutheriæ* a sufficient character for the approximation of these Medusæ to *Cladonema* in the family Oceanidæ. The differences in the structure of the umbrella, in the mode of locomotion, and in the position of the sexual organs (which in *Cladonema*, as in the other Oceanidæ, originate from the wall of the gastric cavity) appear to be more important than the analogies. The author therefore proposes the formation for the *Eleutheriæ* of a separate family—that of the Creeping Medusæ.—*Memorie della R. Accad. d. Sci. di Torino*, serie 2. tom. xxiii.; *Bibl. Univ.* October 25, 1866, *Bull. Sci.* pp. 196–198.

*On the Anatomical Arrangement of the Lymphatics in the Torpedos, compared with that presented by those in the other Plagiostomi.*  
By C. ROBIN.

Although the arrangement of the lymphatics in Fishes is of great simplicity compared with that in other Vertebrata, it nevertheless leaves several important points to be elucidated\*. It has been investigated by several eminent anatomists; but the want of clearness in the descriptions of them in dogmatic works on comparative anatomy shows that more than one of the questions relating to them requires solution.

The organs furnished with lymphatics in these animals are:—

- 1, the *digestive tube*, from the end of the œsophagus to the cloaca;
- 2, the *pancreas* and its duct (the spleen is destitute of them);
- 3, the *hepatic ducts*, the gall-bladder, and the *ductus choledochus*;

\* "In the class of Fishes the lymphatic system is still only very imperfectly known" (Milne-Edwards, *Leçons sur la Physiol. et l'Anat. Comp.* tom. iv. p. 471). Milne-Edwards divides the lymphatics into deep-seated, or visceral, and superficial. The vessels which he, like Monro and other authors, describes among the latter, are cutaneous venous networks and their median, lateral, and subperitoneal collective sinuses.

4, the *oviducts*, the *deferent canals*, and the *cloaca*, but the ovary and testicle have none; 5, the *peritoneum*, which passes in front of the kidney, is furnished with them, and they cease upon the outer sides of this organ, but its proper substance is destitute of them; 6, the *heart*, the intrapericardial portion of the branchial artery, and the pericardium possess lymphatics, which unite with those of the end of the *œsophagus* by trunks existing on the inner surface of the pericardio-peritoneal duct. The surface of the suprahepatic venous sinuses, that of the *vena cava* and its dilatations and sinuses, and that of the branches of the *vena porta* and the corresponding arteries are also provided with them.

The lymphatics of the different regions of the body above enumerated discharge themselves, in the *Torpedos*, by one or several orifices into two prismatic triangular reservoirs, with their inner surface smooth and of serous aspect, and their cavity often traversed by delicate fibrous bundles. These reservoirs open into the dilatations which the *venæ cavæ* present in all the *Plagiostomi* before their arrival in Monro's sinuses.

The precise point of this opening cannot be absolutely ascertained, as it varies a little, not only in different species, but even in different individuals. In *Torpedo* and *Acanthias* it is in the posterior third of the venous dilatation that the lymphatic reservoirs open, by one or two apertures, of which the anterior is almost always smaller than the other. There is no valve at these orifices, nor above them; but they are oval, elongated, narrower in front than behind, and cut obliquely in the thickness of the venous wall, like that of the ureter in the mucous membrane of the bladder. Hence the posterior part of the orifice represents a sort of fold with a delicate, concave, transparent margin, which, under the pressure of the blood distending the *vena cava*, applies itself against the opposite wall, and prevents reflux into the lymphatic reservoirs.

In the species of *Plagiostomi* in which the dilatations of the two *venæ cavæ* communicate with each other by numerous orifices of their common partition (*Torpedo*, *Squatina*, *Galeus*), it is at the lower margin of the common perforated partition that this opening of the lymphatic reservoirs takes place. In *Torpedos* of ordinary dimensions the orifices are from one to three millimetres in diameter.

The networks forming the origin of the lymphatics in the *Plagiostomi* are directly applied against the capillary blood-vessels. If we imagine the section of a capillary, the primary lymphatic always forms upon the sides of this vessel a canal which embraces one-half, two-thirds, or sometimes three-quarters of the circumference of the vessel. The lymphatic represents a canal which has a proper wall only on one side; for the rest of its extent it is bounded by the capillary; or at least, to be more exact, the proper coat of the lymphatic adheres intimately at this point to the outer coat of the capillary, on a part of the circumference of the latter, without losing its continuity with the other portion. The lymphatic vessels are thus applied to the sides of the capillaries. But this arrangement is also observed in voluminous vessels, especially arterial ones.

In Fishes, Batrachia, and even Reptiles, this arrangement occurs even round the aorta. In them the lymphatics are applied to the arterial vessels, of which they embrace one-half, three-quarters, or even the whole. The true capillaries, and even some small arteries, which diverge from the principal blood-vessels, traverse these lymphatics transversely, and are thus completely immersed in the lymph for a short portion of their course; sometimes even a branch of the lymphatic accompanies them. This arrangement merits notice, because something analogous to it is met with about the capillaries of the encephalon and spiral marrow of the Mammalia\*.

From the whole of these facts, it seems to result that the chief use of the lymphatics is to charge themselves with the excess of that portion of the blood-plasma which arrives in the capillaries, and issues from them at each systole of the ventricles. In fact we know that the quantity of lymph flowing is much greater when there is a considerable afflux of blood to an organ than when the latter is in a state of repose.

Moreover I have ascertained, by the examination of living Rays in M. Coste's laboratory at Concarneau, that the great lymphatic vessels contain only a few drops of lymph when they are opened several minutes after the removal of the fish from the water. This fact coincides with the paleness of the intestine and the state of comparative vacuity of the vessels. This lymph is more abundant when the animal is opened immediately on its removal from the water, and when at the same time the intestine still contains food in course of digestion; then also the blood-vessels contain more blood.

There is reason to think that under certain conditions of the life of these fishes, which live at a great depth, these large ducts are full, or nearly so, when certain modifications of the circulation, of the kind just indicated, occur.

In the cavity of the lymphatic, between the concave inner surface of its free wall and the convex outer surface of the capillary to which the other portion of its wall is applied, the following phenomena may be detected by the microscope:—In the living animal a hyaline lymph holding leucocytes in suspension is seen circulating. The movement of the leucocytes is oscillatory, but with a slow progression in a direction opposite to that followed by the blood in the contiguous artery. The leucocytes of the blood are carried along by the blood-corpuscles, but more slowly than the latter, and they may be seen momentarily arrested against the inner concave surface of the capillary and separated from the lymph by its wall. The leucocytes of the lymph are the only elements perceptible in that liquid; and no red globules are found in it. These leucocytes (in the mesentery of the lizards which were the subjects of my observations) are about one-third smaller than those of the blood; they float in the liquid for the most part, and only a few are applied to the inner surface of the lymphatic. They are also rather less granulated than those of the blood. Their outline is darker, like that of the leucocytes

\* C. Robin, *Journal de la Physiologie*, 1859, pp. 537 & 719.



which have become smaller when transported from a comparatively thin liquid into a denser one.

It is well known, however, that E. H. Weber long since ascertained, in the mesentery of living frogs, the presence of lymphatics surrounding the capillary blood-vessels. Under the microscope he saw the rapid currents of the blood surrounded on all sides by the current of the lymph, which was from ten to twenty times as slow, these currents being separated from each other by the arterial coat in such a manner that there was no mixture of the globules of the lymph with those of the blood.

As I have neither time nor space for the exposition of the historical investigations which I have made upon this subject, they will find a place in the fourth volume of the 'Journal d'Anatomie et de Physiologie,' where this memoir will be published entire.

To sum up. From the numerous observations and experiments which I have made, it consequently follows that the cutaneous and subcutaneous vessels described by Monro, Hewson, &c. as lymphatics are veins; some in the condition of true veins, others in that of venous sinuses. Beyond these veins it is impossible to inject any vessel, either by means of mercury or otherwise. The division of the lymphatics of fishes into *superficial* and *deep-seated* or *visceral*, still adopted by some modern authors, must, consequently, be abandoned, the former kind of vessels not existing in this class of Vertebrata.—*Comptes Rendus*, January 7, 1866, pp. 20–24.

#### On *Xenacanthus Dechenii*. By Prof. KNER.

Professor Kner has investigated the fossils referred to *Xenacanthus Dechenii* (Beyr.) in the Museums at Vienna, Dresden, Berlin, and Breslau, and states the results of his examination as follows:—

1. From the structure of its fins, it cannot be approximated either to *Squatina* or to any other genus of Plagiostomi or Cartilaginous Fishes; nor, notwithstanding its peculiarly formed and frequently united ventral fins, can it be placed in the vicinity of the *Discoboli*. It rather represents a genus singularly intermediate between the Placoids (Selachii) and Malacopterygii, one of the transitional forms characterized by Agassiz as "prophetic types," and, in Professor Kner's opinion, can only find its nearest allies among living fishes in the great group of the Siluroidei, although still very distant from these.

2. It is certain that *Diplodus* (Agass.), *Orthacanthus* (Goldf.), and *Xenacanthus* (Beyr.) are generically identical; and this statement probably applies also to *Pleuracanthus* (Agass.).

3. On the other hand, however, it seems very probable that *Xenacanthus Dechenii* will have to be divided into at least two species, which might be characterized as *laevicens* and *ptychodus*, unless the remarkable differences are merely sexual.—*Bericht der Akad. d. Wiss. in Wien*, January 3, 1867, p. 6.